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ROWAD MODERN ENGINEERING		Moataz Shady **Structural acoustic engineer**
		Kareem Ahmed **Structural acoustic engineer**
		Page 1 to 24
Project: Shooting dome		Date: 11/10/2023

Weight load of finishing applied on Enosh wall damping construction

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Checked by:
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Contents

Abstract

The above sound channels are positioned between the drywall and the studs. The sound channels act as a buffer and absorb the bass vibrations without transmitting too much bass to the studs. This is where enosh wall damper (square mount damper) is useful. The wall damp s are very effective in turning bass vibrations into heat. When a tone slightly shakes the floating wall, which happens to be the same frequency as the resonance of the supporting stud, the stud is stimulated onto movement.

This study will present metal stud and dampers (square hanger) maximum weight laud can carry of

Introduction

Enosh wall damping construction system insulation will virtually eliminate all midrange and treble frequencies. Attenuating bass frequencies is a whole different ball game. Bass frequencies can set your drywall into a resonant rampage. Since wooden studs are connected to the drywall, the studs can also resonate as well. Thus the bass can be transmitted throughout the entire space
the Gypsum Construction Handbook are from ASTM C754 and were developed by the Gypsum Association. CGC presents these data as a reference, but is not responsible for performance of the wall based on them. Loads Framing members and their installation must be selected according to their ability to withstand the loads to which they will be subjected. These include live loads (contributed by the occupancy and elements such as wind, snow and earthquake) and dead loads (weight of the structure itself). Minimum lateral load for interior partitions is 240 Pa (5 psf); for exterior walls 720 Pa (15 psf) to 2160 Pa (45 psf) or greater depending on building height and geographic location. Deflection Even though an assembly is structurally capable of withstanding a given load, its use may be restricted if the amount of deflection that would occur when the lateral load is applied exceeds that which the surfacing materials can sustain without damage. Obviously, this deflection factor influences the selection of surfacing materials.
Bending Stress Framing members also must withstand any unit force exerted that will break or buckle the stud, based on the capacity of the studs acting alone. End Reaction Shear This factor is determined by the amount of force applied to the stud which will bend or shear the runner, or buckle the web of the stud. Frame Spacing A factor in load-carrying capability and deflection, it also is a limiting factor for the finishing materials. Every finishing or surfacing material is subject to a span limitation—the maximum distance between frame members that a material can span without undue sagging. For that reason, “maximum frame spacing” tables for the various board products are included in this chapter. However, where frame spacing exceeds maximum limits, furring members can be installed to provide necessary sag resistance support for the surfacing material

II-Description

The system is constituted by Metal stud 10 cm each 0.6 -0.65m of the wall joint with anti-vibration Square mount 35mm and location of antivibration every 1.2m – 1.5m along the metal stud 10cm with rock wool thickness 100mm dinasty 70kg/m3 inside the metal stud.the2 layer of Gypsum board 1.2 cm Thick located on the surface of metal stud after the rubber pad with a thickness of 3 mm is placed on the metal stud grad then covered with Enosh wall Panel 1.2m x 0.6 m . after the gypsum board.

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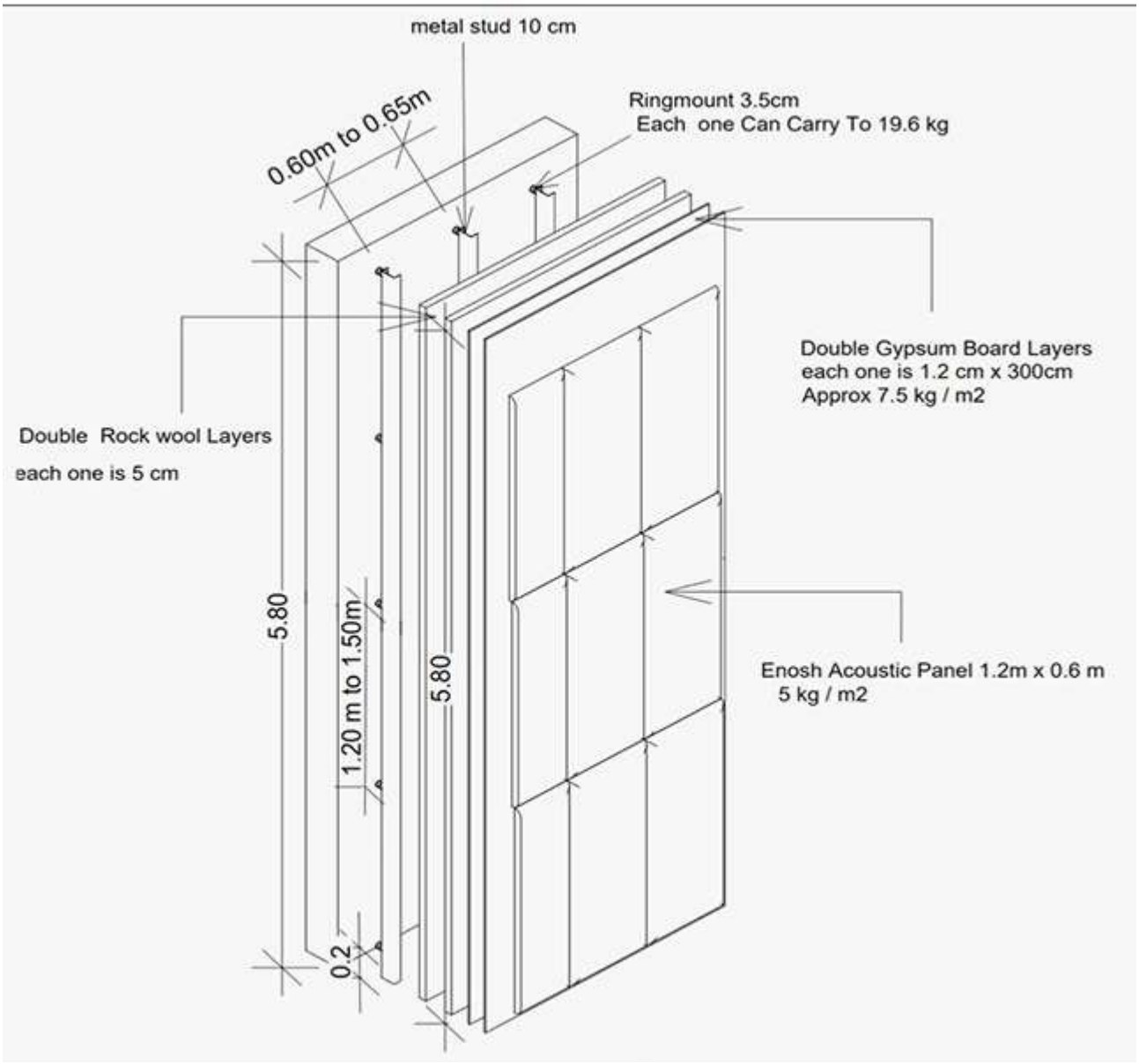
Calculation note for metal stud



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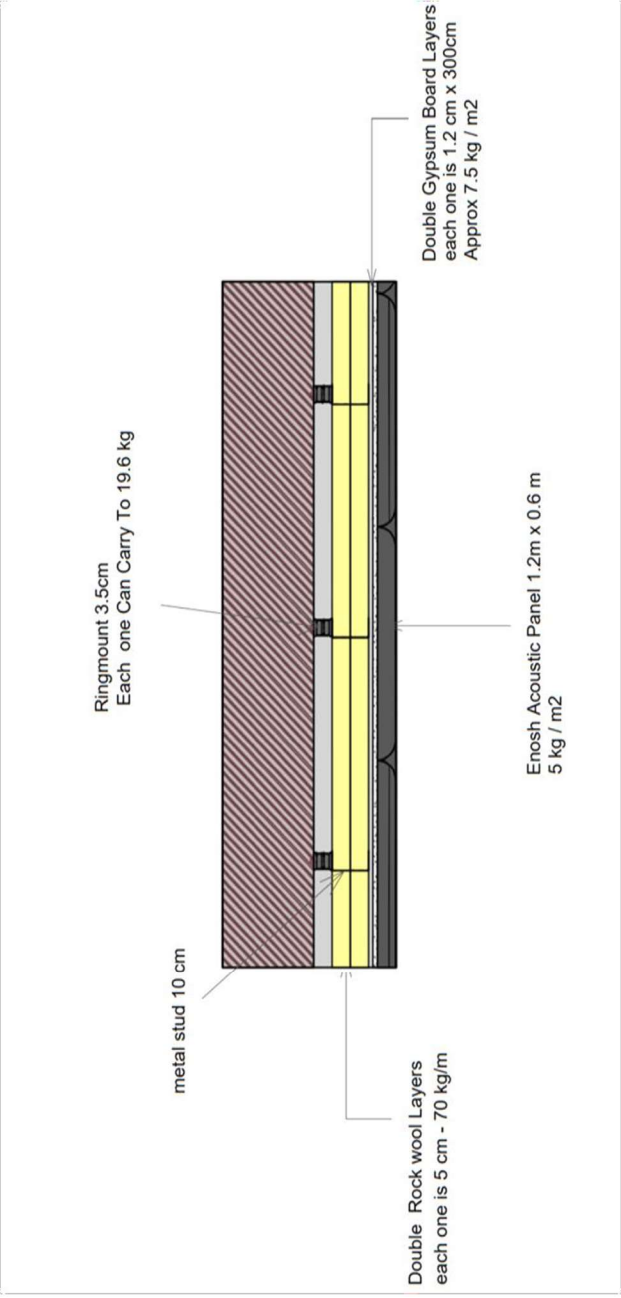
Enosh wall details



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By using software as following

*1-*Auto cad

use AutoCAD to:

- **Design and annotate** 2D geometry and 3D models with solids, surfaces, and mesh objects
- **Automate tasks** such as comparing drawings, replacing blocks, counting objects, creating schedules, and more
- **Create a customized workspace** to maximize productivity with add-on apps and APIs

3-SAP2000

SAP2000 offers a wide range of code-based design features for steel frame,concrete frame, cold form steel, and aluminum frame.

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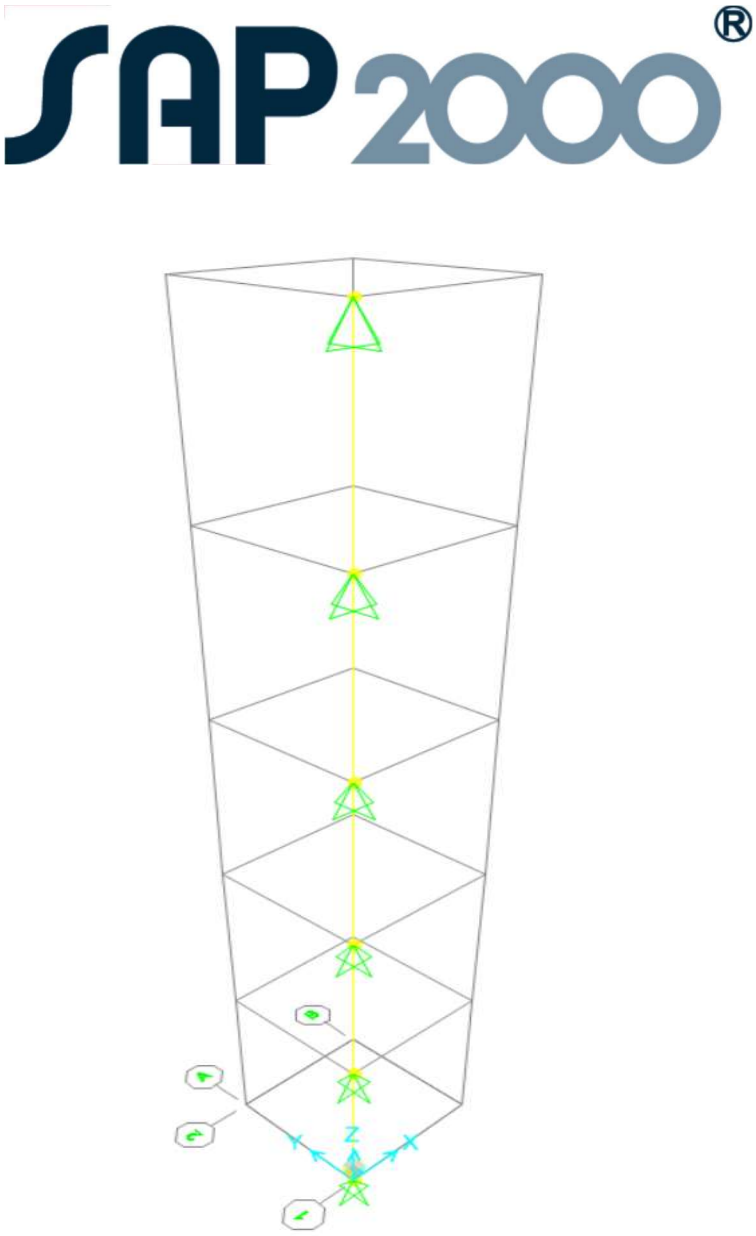
Design using SAP2000



SAP2000 Analysis Report

Model Name: Enosh Damping Wall System

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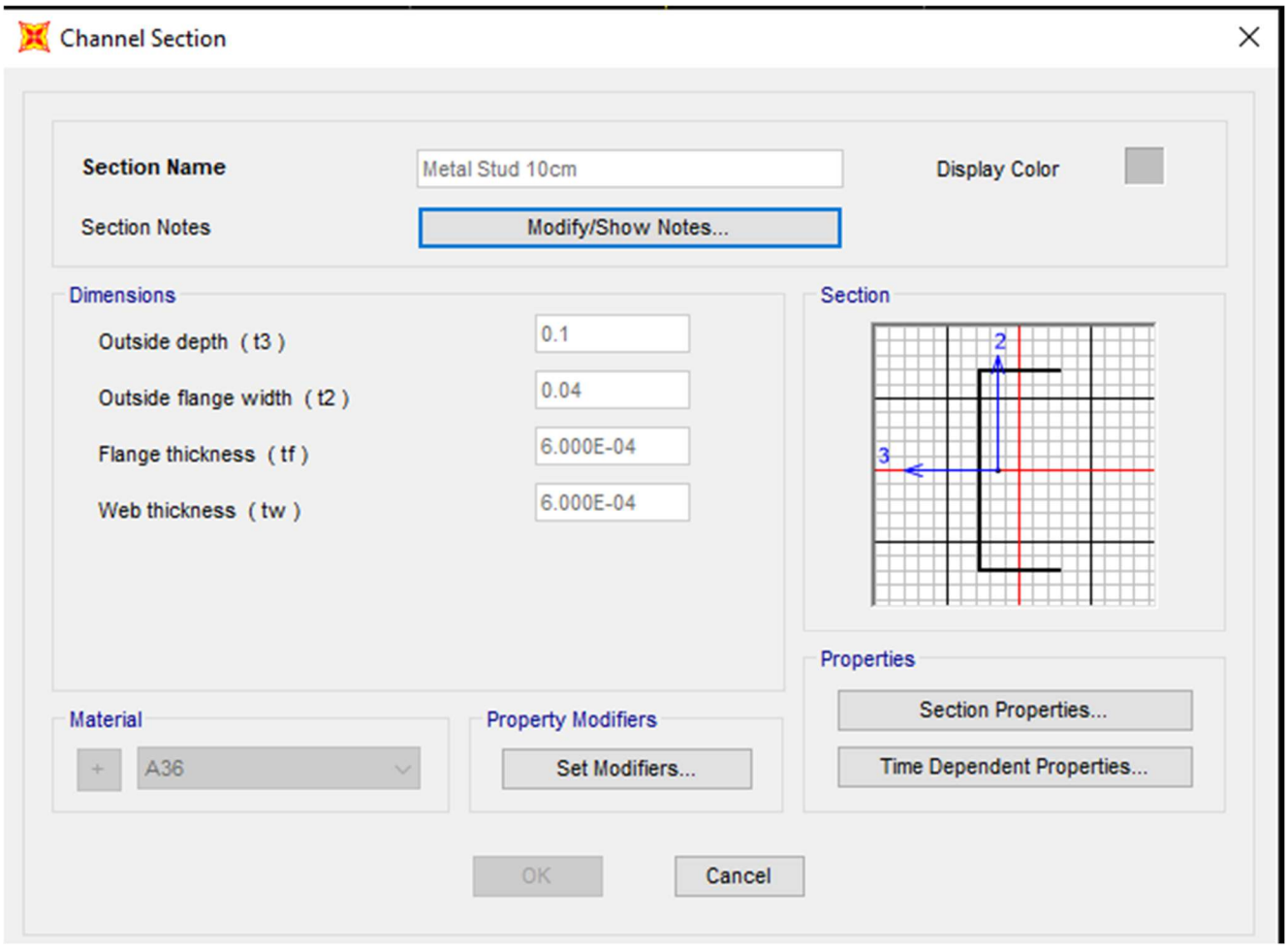
TEST RESULTS

Metal Stud 10cm (C – Section)



loads

1- Own Weight of Metal Stud 10 cm (Dead Load).

By Applying the loads of Enosh Wall Damping System in (Kgf/m) :

item	weight
2 layer Gypsum board	7.5 kg/m2
Enosh wall panel	5 kg/m2

1- 2 layer Gypsum board =

7.5*1*1*2= 15 Kg / m = 15 / 9.8 = 1. 53kg f / m

2- Panel weight = 5*1*1= 5 kg = 0.51 kgf / m

Then ,

loads of Enosh Wall Damping System

for 2 metal studs = 20 kg / m = 2.04 kgf / m

2- Distributed load of Enosh wall Damping System for each metal stud (Super Dead)

= 2.04 kgf / m ÷ 2 = 1 kgf / m

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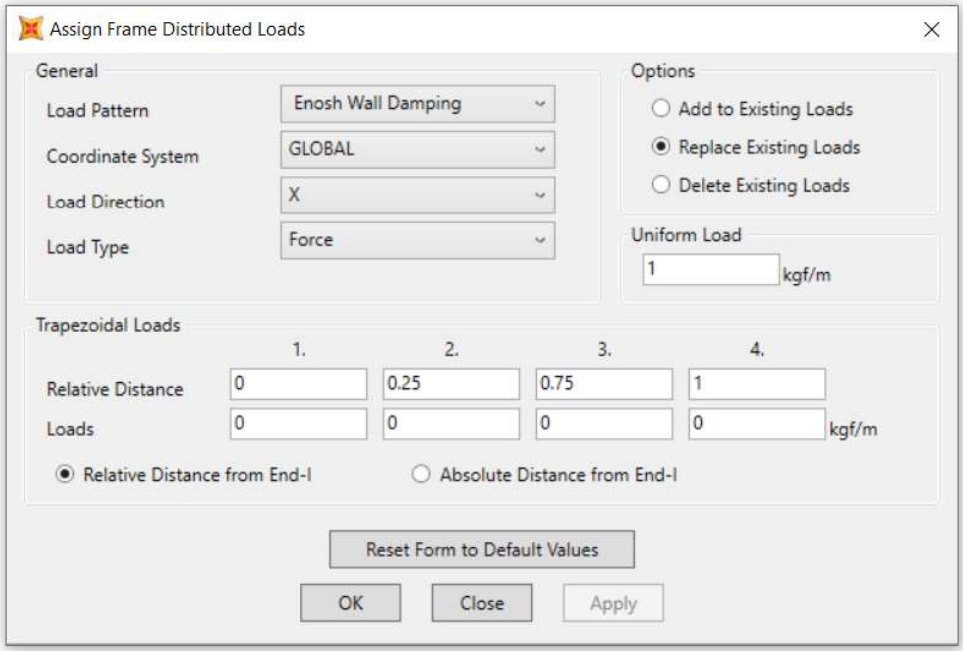
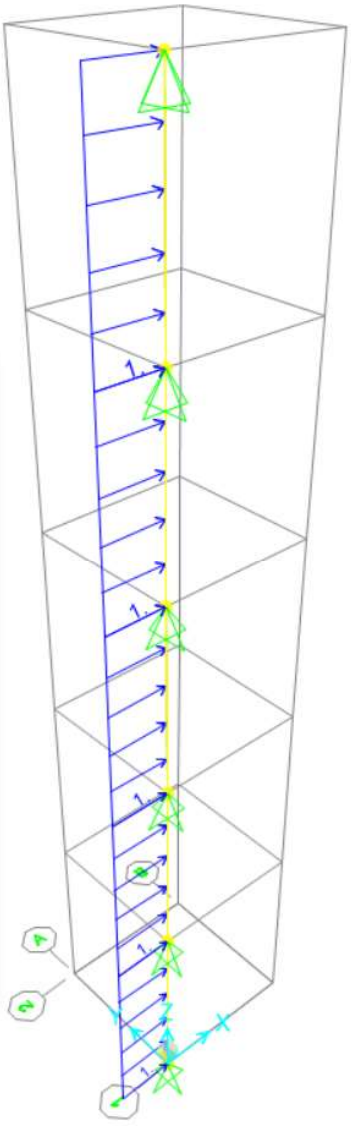
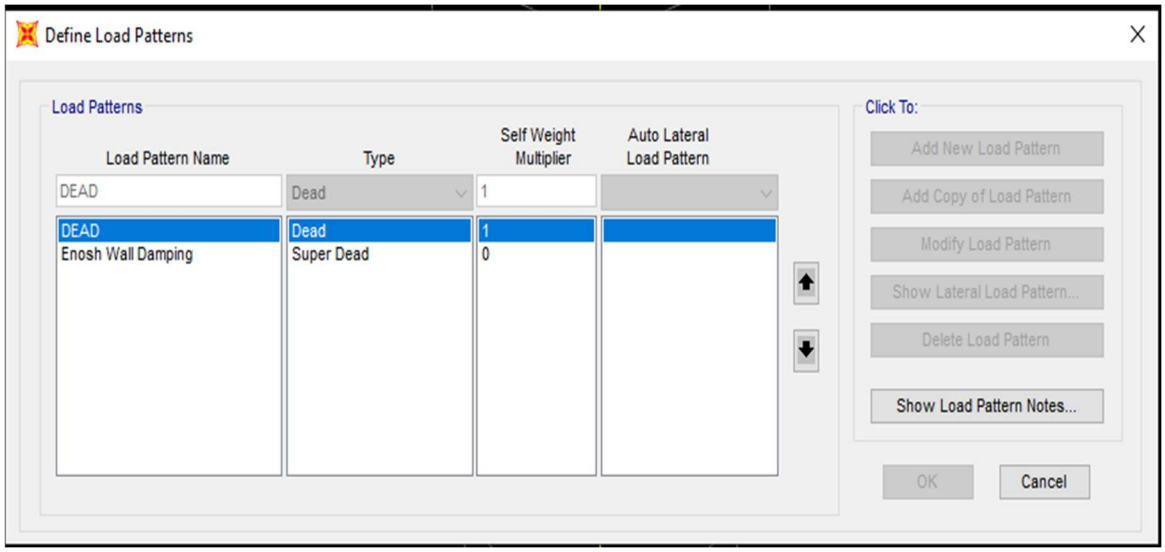
loads of Enosh Wall Damping System in (Kgf/m)

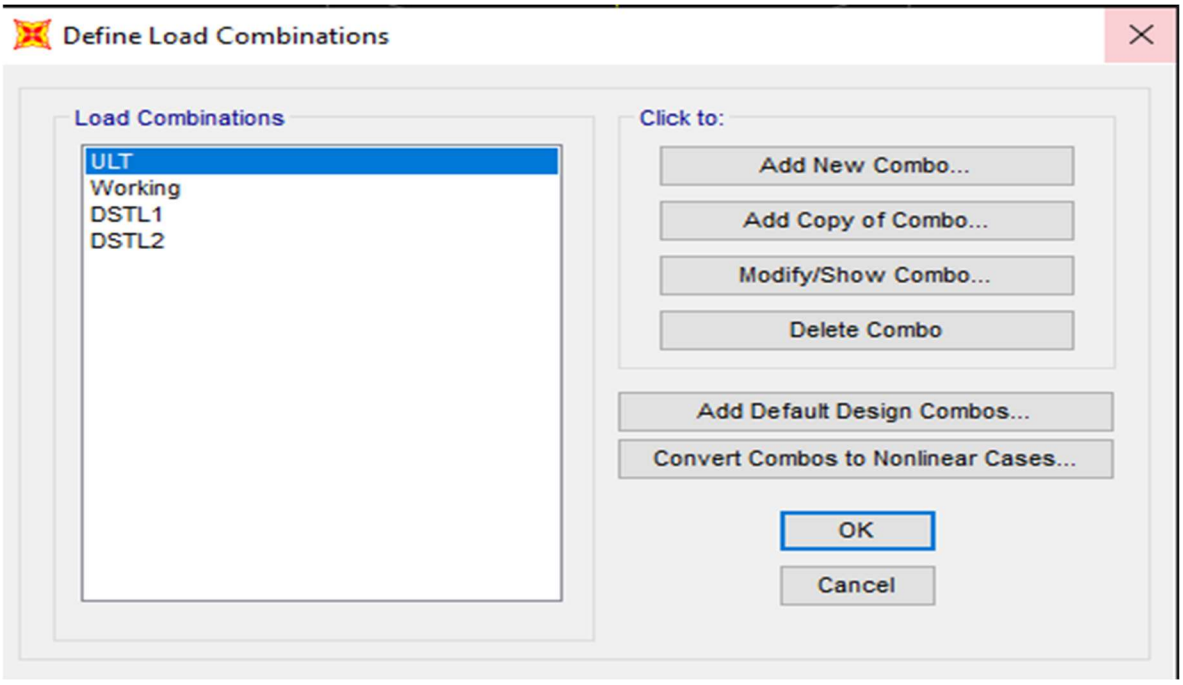




-Load patterns



-Load Combination



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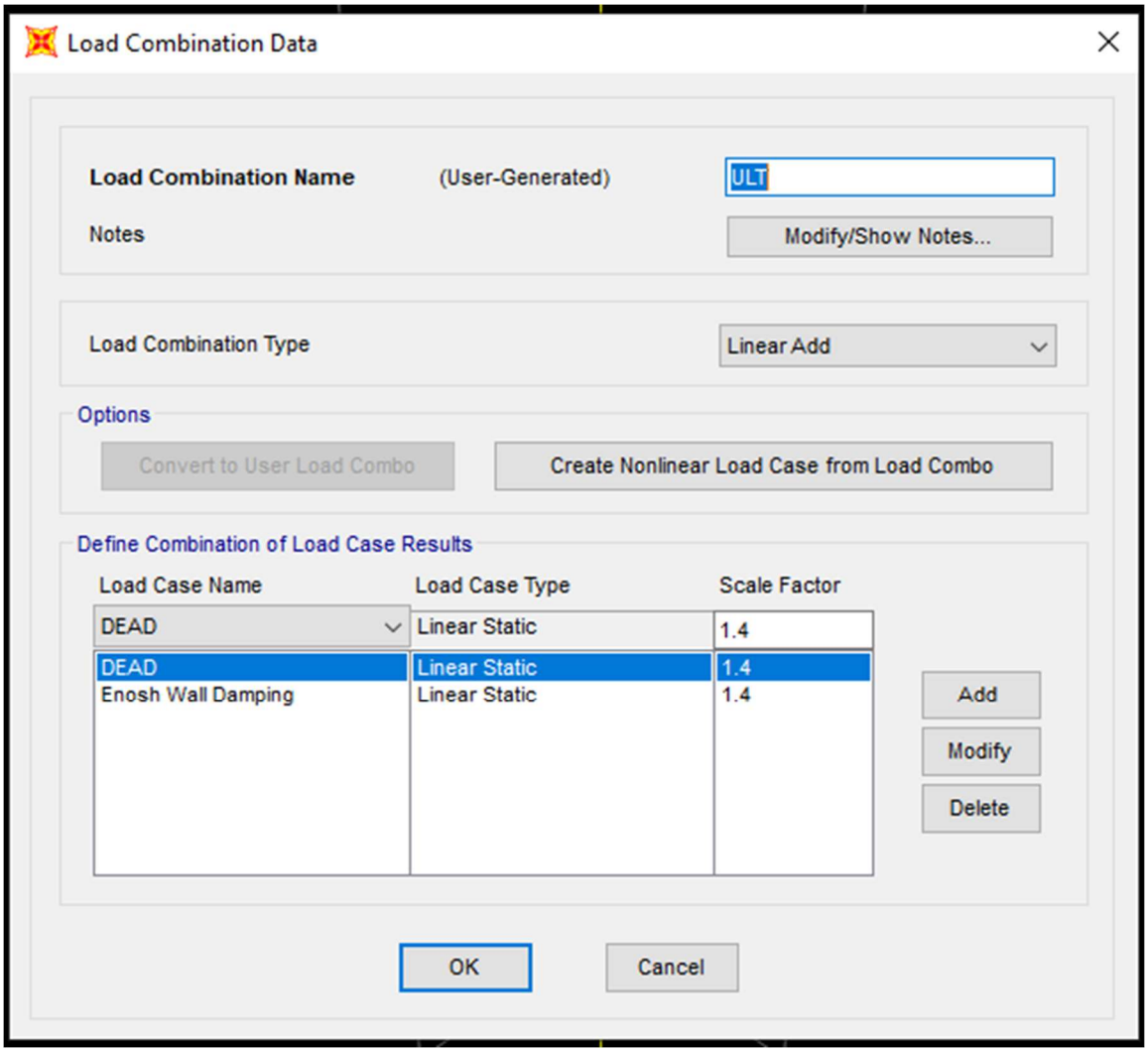
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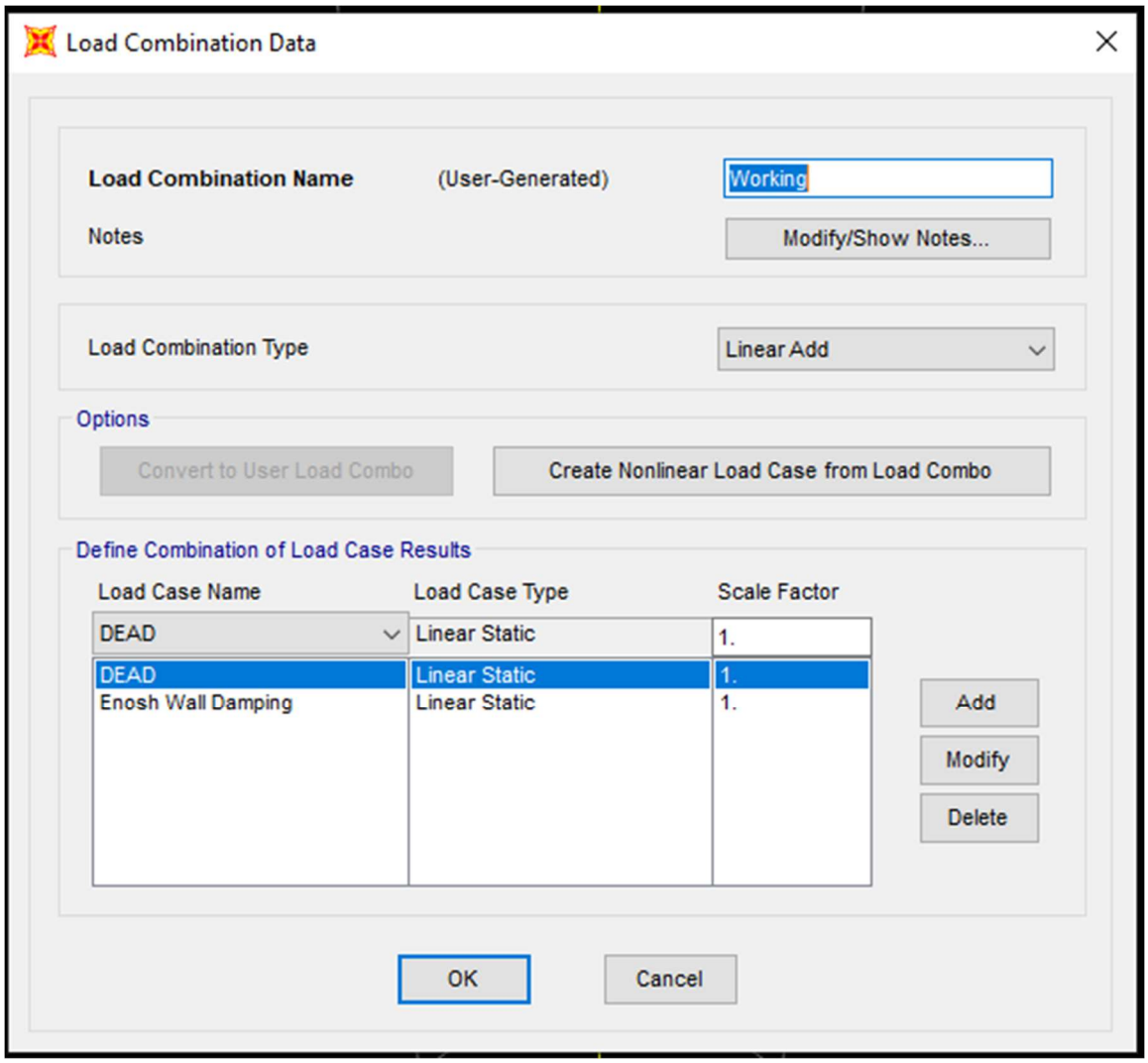
Load Combination Name
(User-Generated)
ULT
Notes
Modify/Show Notes...
Load Combination Type
Linear Add
Options
Convert to User Load Combo
Create Nonlinear Load Case from Load Combo
Define Combination of Load Case Results
Load Case Name
Load Case Type
Scale Factor
DEAD
Linear Static
1.4
DEAD
Linear Static
1.4
Enosh Wall Damping
Linear Static
1.4
Add
Modify
Delete
OK
Cancel

Working


Load Combination Data
Load Combination Name
(User-Generated)
Working
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Modify/Show Notes...
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Linear Add
Options
Convert to User Load Combo
Create Nonlinear Load Case from Load Combo
Define Combination of Load Case Results
Load Case Name
Load Case Type
Scale Factor
DEAD
Linear Static
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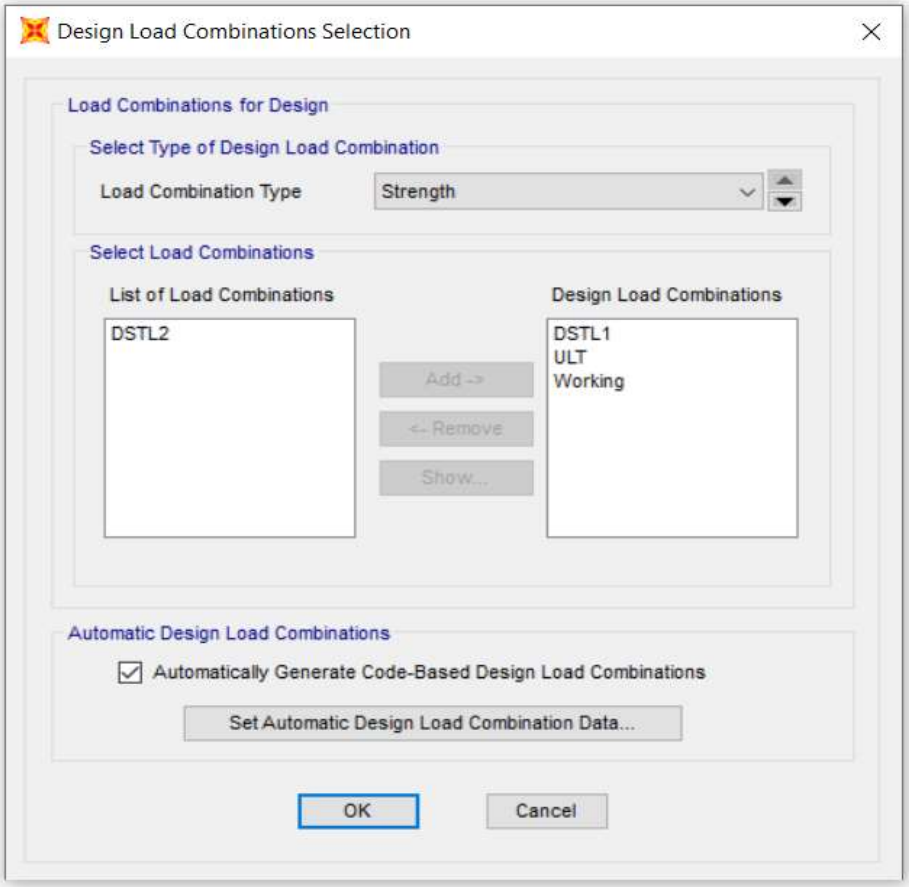
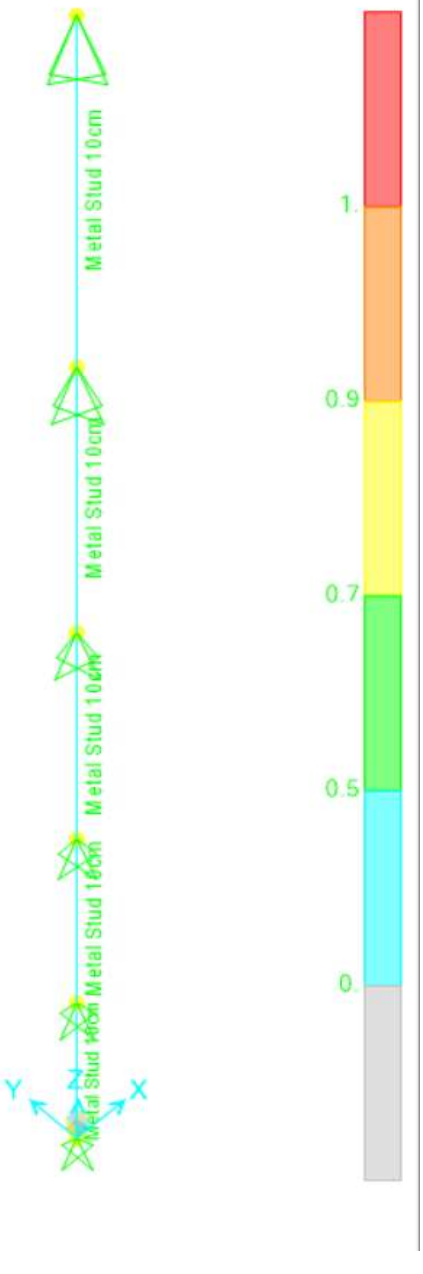
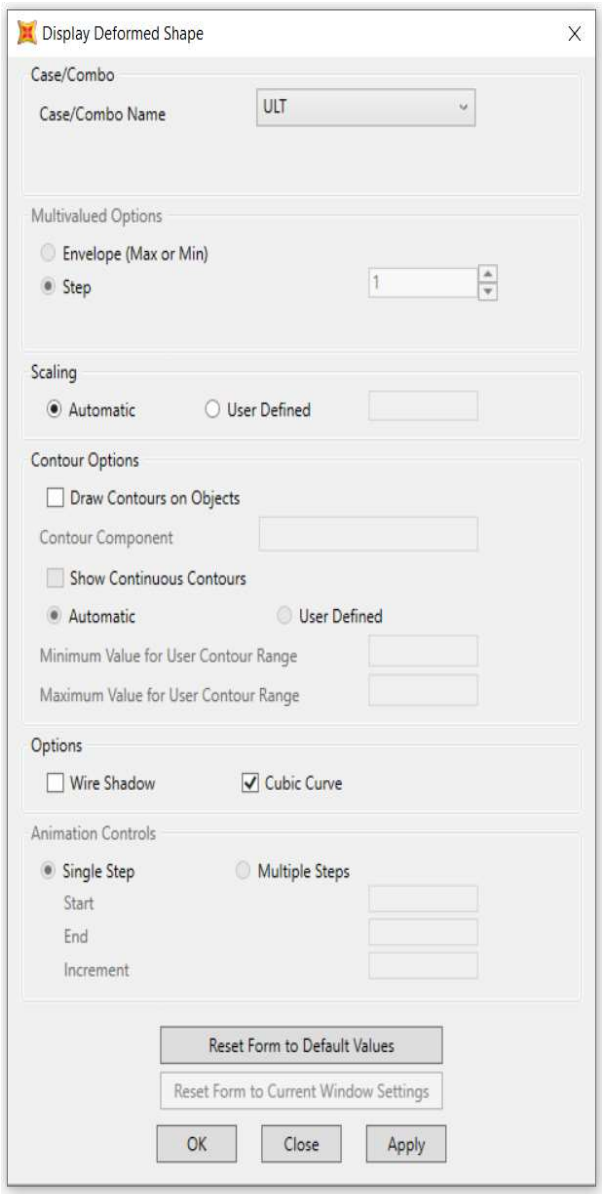
DEAD
Linear Static
1.
Enosh Wall Damping
Linear Static
1.
Add
Modify
Delete
OK
Cancel

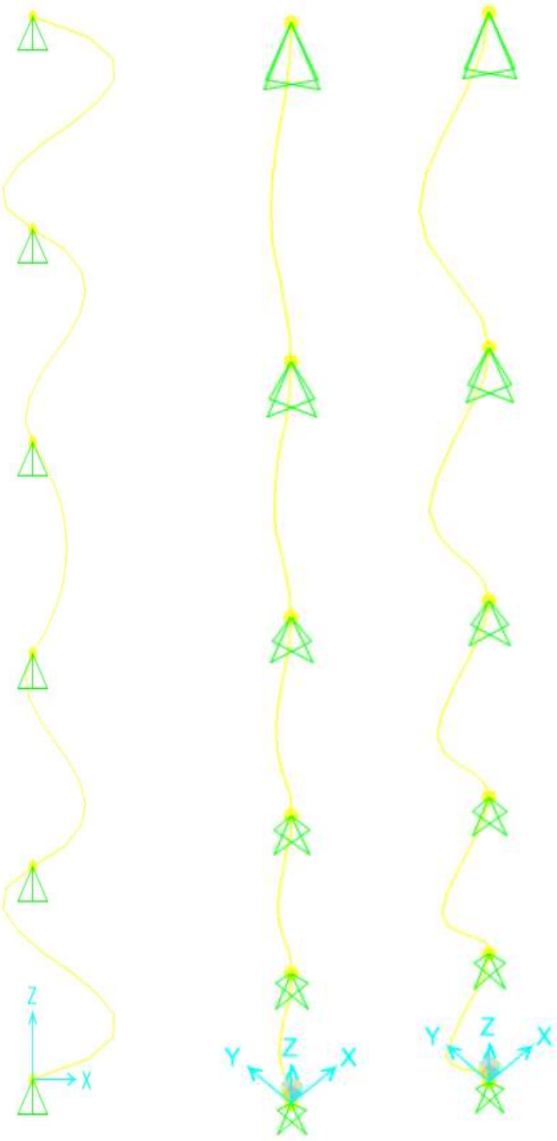
Design check



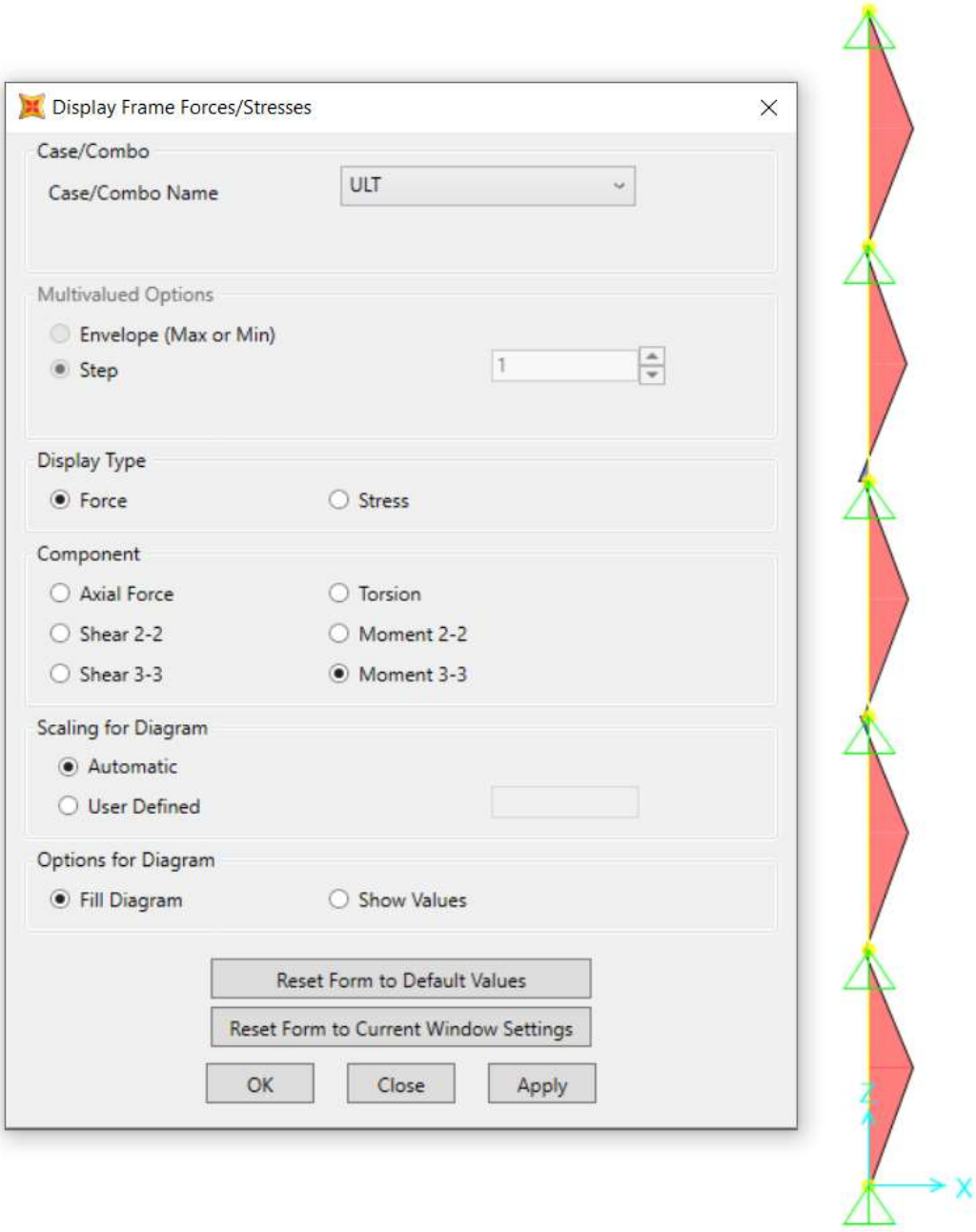


Show Deformed Shape:

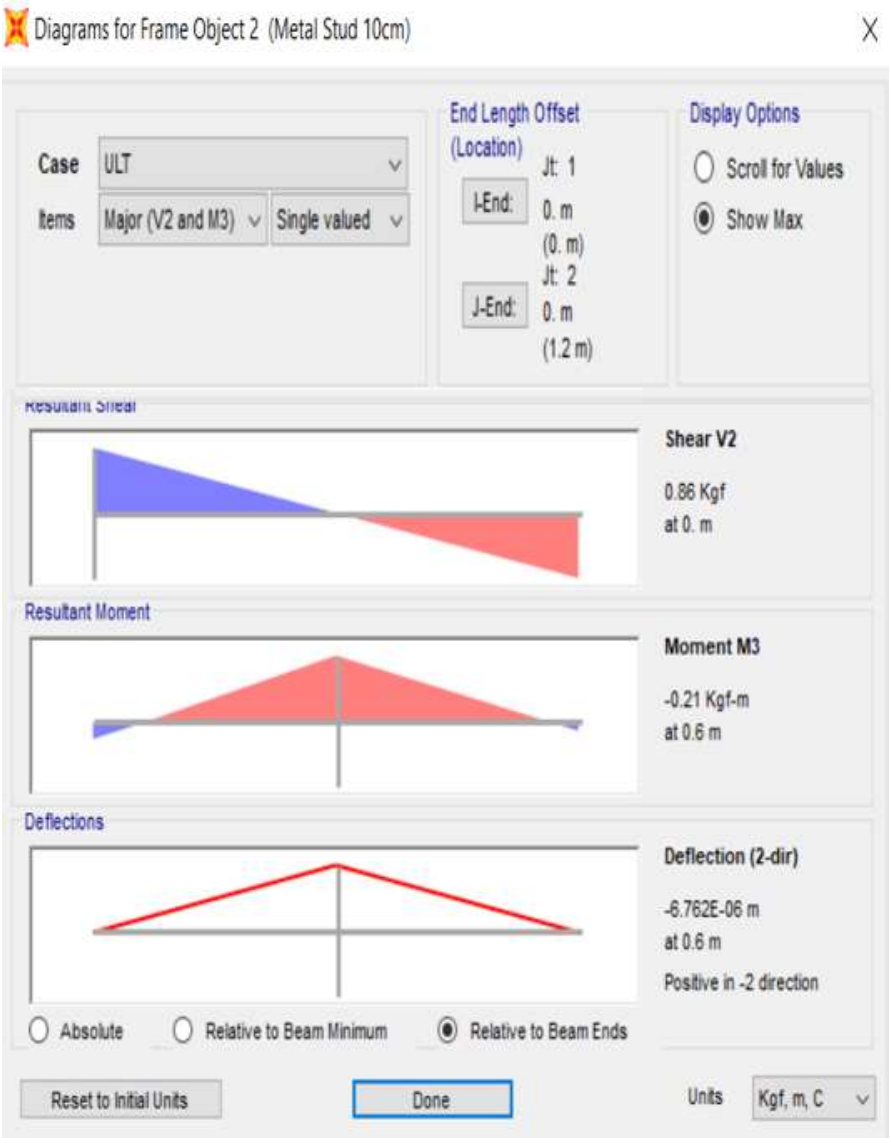




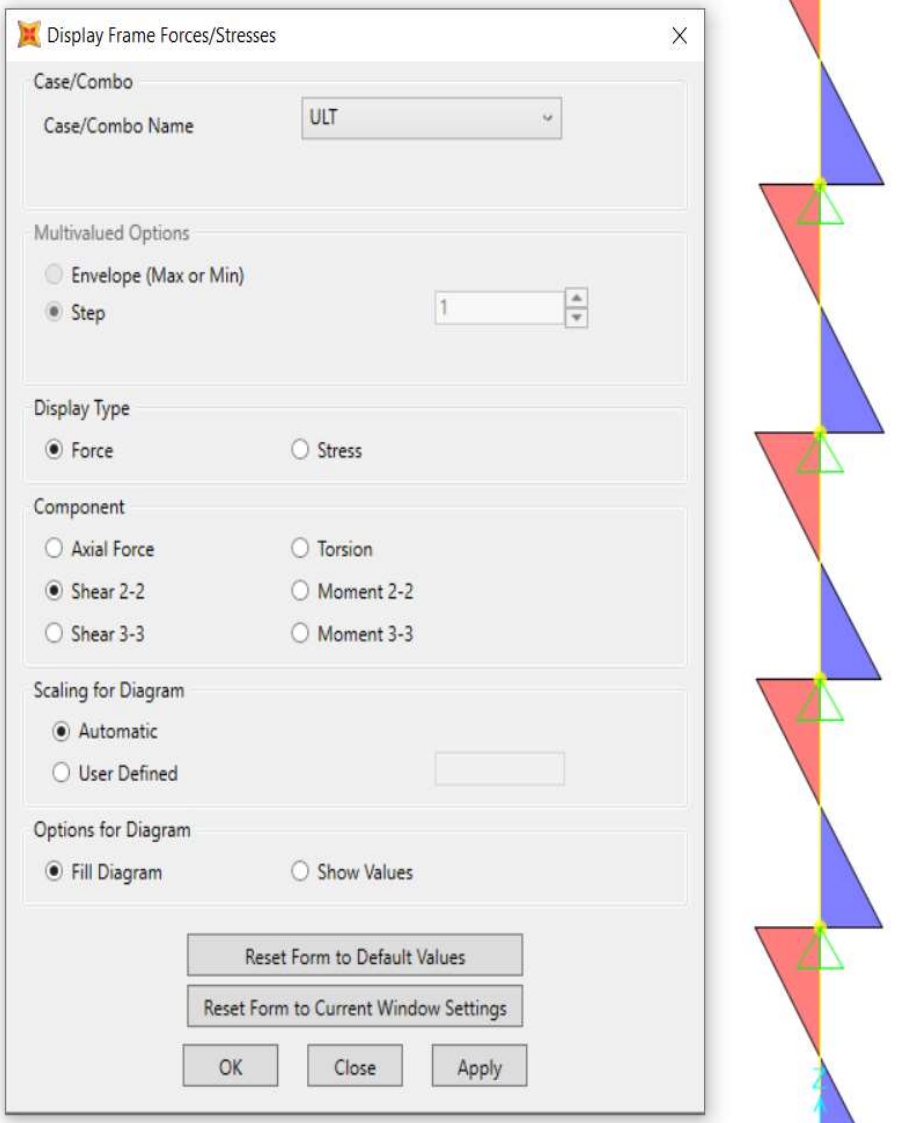
Bending Moment stress(B.M.D):



Max- Moment on the Metal Stud 10cm



Shear stress (S.F.D):



Max- Shear on the Metal Stud 10cm

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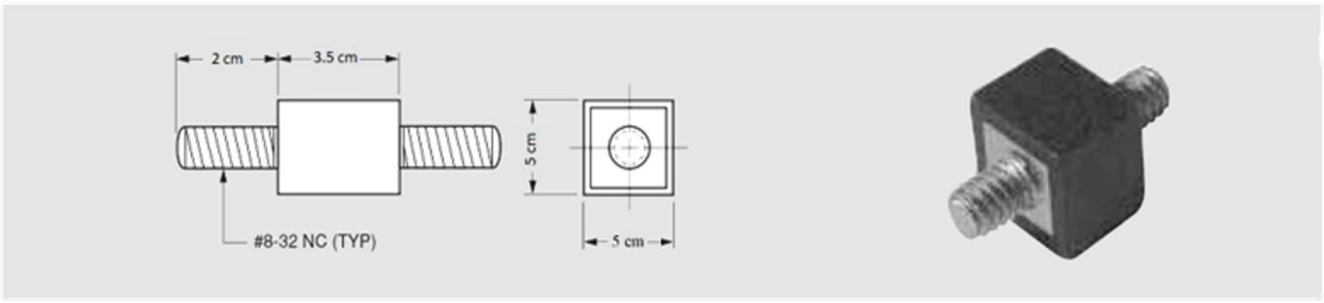
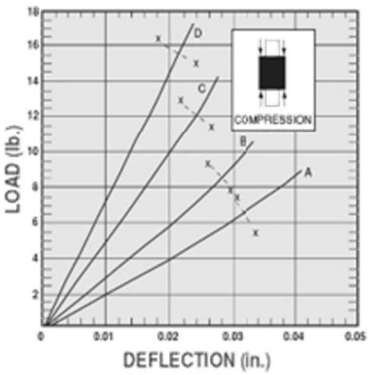
Check Rubber Mount 5cm x 5cm x 3.5 cm (V10Z 1-322D)

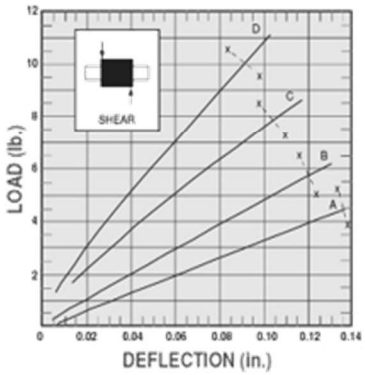


NOTE: Dimensions in ( ) are mm.

NOTE: Maximum unthreaded portion of stud does not exceed 1/16 inch (1.59 mm).

LOAD DEFLECTION GRAPHS
Deflections below the line x–x are considered safe practice for static loads; data above that line are useful for calculating deflections under dynamic loads.





Catalog Number	Mode	Maximum Load lb. (kgf)	Forcing Frequency in Cycles per Minute							
			1500	1750	2000	2250	2500	2750	3000	3600
			Minimum Load for 81% Isolation lb. (kgf)							
V10Z 1-322A	Compression	6.6 (3)	—	—	—	—	—	5.4 (2.5)	4.5 (2)	3.2 (1.5)
	Shear	4.4 (2)	3.3 (1.5)	2.4 (1.1)	1.9 (0.9)	1.5 (0.7)	1.3 (0.6)	1.1 (0.5)	*	*
V10Z 1-322B	Compression	8.7 (4)	—	—	—	—	—	8.5 (3.9)	6.9 (3.1)	4.8 (2.2)
	Shear	5.5 (2.5)	4.8 (2.2)	3.6 (1.6)	2.8 (1.3)	2.2 (1)	1.9 (0.9)	1.6 (0.8)	*	*
V10Z 1-322C	Compression	12.0 (5.4)	—	—	—	—	—	—	11.5 (5.2)	8.0 (3.6)
	Shear	7.8 (3.54)	7.7 (3.5)	6.0 (2.7)	4.9 (2.2)	4.0 (1.8)	3.5 (1.6)	3.1 (1.4)	*	*
V10Z 1-322D	Compression	15.4 (7)	—	—	—	—	—	—	—	11.8 (5.4)
	Shear	9.9 (4.5)	—	8.2 (3.7)	6.7 (3)	5.6 (2.5)	4.7 (2.1)	4.1 (2.1)	*	*

*At these forcing frequencies, lesser loads will yield less than 81% isolation.

- Max . Allow .Shear of (V10Z 1-322D) = 4.5 kgf

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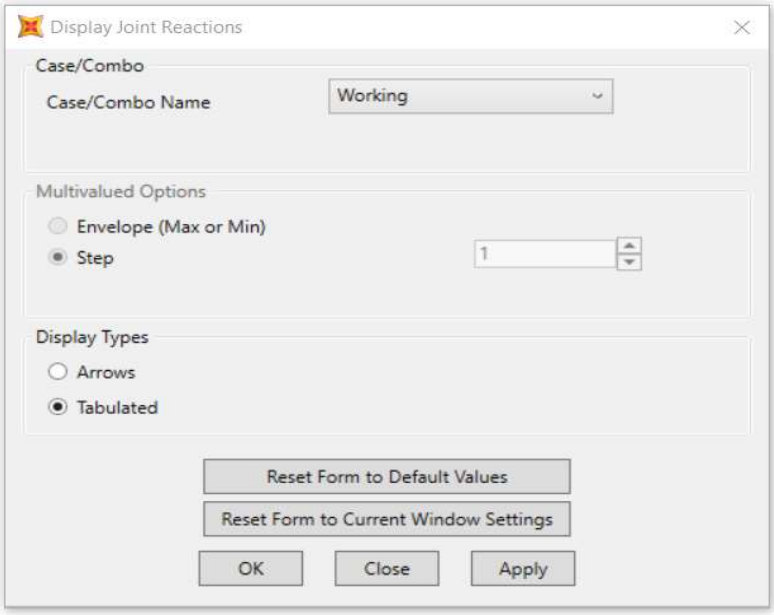
Act. Shear on the rubber mount

Table: Joint Reactions

Table: Joint Reactions

	Joint Text	OutputCase	CaseType Text	F1 Kgf	F2 Kgf	F3 Kgf
▶	1	ULT	Combination	-0.81	0	0.71
	1	Working	Combination	-0.58	0	0.51
	2	ULT	Combination	-1.69	0	1.41
	2	Working	Combination	-1.21	0	1.01
	4	ULT	Combination	-1.7	0	1.41
	4	Working	Combination	-1.22	0	1.01
	5	ULT	Combination	-1.7	0	1.41
	5	Working	Combination	-1.22	0	1.01
	6	ULT	Combination	-1.66	0	1.41
	6	Working	Combination	-1.18	0	1.01
	7	ULT	Combination	-0.84	0	0.71
	7	Working	Combination	-0.6	0	0.51



For,

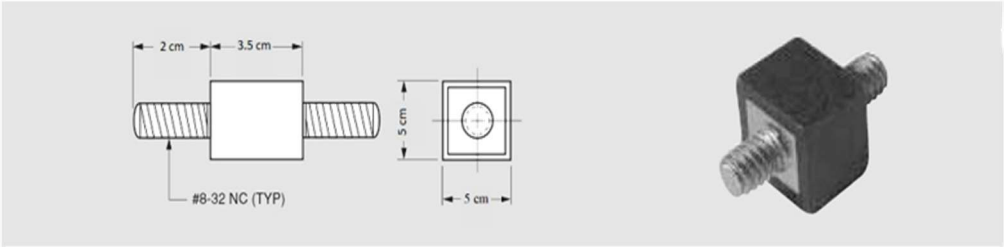
Act. shear = 1.22kgf < Allow. Shear = 4.5kgf

Then ,

Using of Rubber mount 5cm x 5cm x 3.5cm is Safe

Anti-vibration hanger mount wall damper diffraction

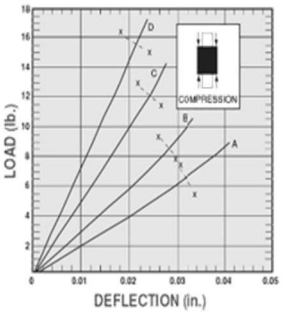
A simple way, commonly used for engineering materials, accounting for this dissipative attribute is to apply a hysteretic model with a frequency-independent complex dynamic modulus. However this approach fails to fulfill the causality requirement for transient loads as enunciated by Crandall (1970). Another commonly used approach is to apply a viscoelastic Kelvin–Voigt model assuming a frequency directly proportional dependence of the loss modulus. Yet, the dynamic behavior of rubber materials present substantial deviations with these models, requiring a more adjustable approach to capture its rheological comportment, being likely to find itself between elasticity and viscosity.

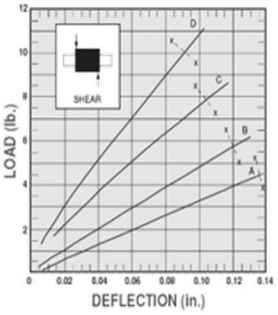


NOTE: Dimensions in ( ) are mm.

NOTE: Maximum unthreaded portion of stud does not exceed 1/16 inch (1.59 mm).

LOAD DEFLECTION GRAPHS
Deflections below the line x–x are considered safe practice for static loads; data above that line are useful for calculating deflections under dynamic loads.





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			Minimum Load for 81% Isolation lb. (kgf)							
V10Z 1-322A	Compression	6.6 (3)	—	—	—	—	—	5.4 (2.5)	4.5 (2)	3.2 (1.5)
	Shear	4.4 (2)	3.3 (1.5)	2.4 (1.1)	1.9 (0.9)	1.5 (0.7)	1.3 (0.6)	1.1 (0.5)	*	*
V10Z 1-322B	Compression	8.7 (4)	—	—	—	—	—	8.5 (3.9)	6.9 (3.1)	4.8 (2.2)
	Shear	5.5 (2.5)	4.8 (2.2)	3.6 (1.6)	2.8 (1.3)	2.2 (1)	1.9 (0.9)	1.6 (0.8)	*	*
V10Z 1-322C	Compression	12.0 (5.4)	—	—	—	—	—	—	11.5 (5.2)	8.0 (3.6)
	Shear	7.8 (3.54)	7.7 (3.5)	6.0 (2.7)	4.9 (2.2)	4.0 (1.8)	3.5 (1.6)	3.1 (1.4)	*	*
V10Z 1-322D	Compression	15.4 (7)	—	—	—	—	—	—	—	11.8 (5.4)
	Shear	9.9 (4.5)	—	8.2 (3.7)	6.7 (3)	5.6 (2.5)	4.7 (2.1)	4.1 (2.1)	*	*

*At these forcing frequencies, lesser loads will yield less than 81% isolation.

Calculations:

By Applying the loads on :

1: Metal Stud 10cm

a- Enosh Iso System for the Wall (2 layer Gypsum board + Enosh wall panel) = 1 kgf/m

2: Fixation Supports (Rubber mount 5cm x 5cm x 3.5 cm)

a- Weight of Metal Stud 10cm

b- Enosh Iso System for the Wall (2 layer Gypsum board + Enosh wall panel) = 1 kgf/m

, ***By using the load combinations:***

A – working

Working load = dead + live

b- ult

Ultimate load = 1.4 dead + 1.6 live

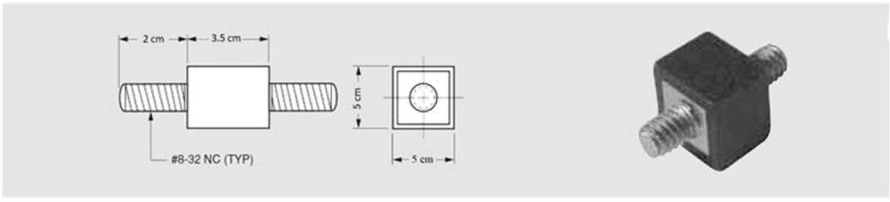
Conclusion :

The Load - Bearing system for Enosh wall system can carry the load of:
1-Weight of Metal Stud 10cm.
2-Enosh Iso System for the Wall.
, For That the dome Isolation walls design is safe and does not cause any danger to the structure.

Material list data sheet

-Square mount 3.5 cm

Square Mounts – To 15.4 lbs.



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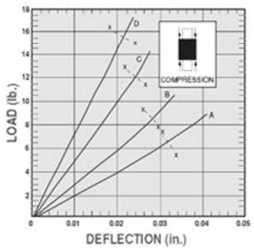

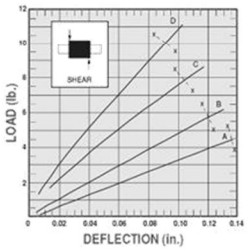

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	Shear	4.4 (2)	3.3 (1.5)	2.4 (1.1)	1.9 (0.9)	1.5 (0.7)	1.3 (0.6)	1.1 (0.5)	*	*
V10Z 1-322B	Compression	8.7 (4)	—	—	—	—	—	8.5 (3.9)	6.9 (3.1)	4.8 (2.2)
	Shear	5.5 (2.5)	4.8 (2.2)	3.6 (1.6)	2.8 (1.3)	2.2 (1)	1.9 (0.9)	1.6 (0.8)	*	*
V10Z 1-322C	Compression	12.0 (5.4)	—	—	—	—	—	—	11.5 (5.2)	8.0 (3.6)
	Shear	7.8 (3.54)	7.7 (3.5)	6.0 (2.7)	4.9 (2.2)	4.0 (1.8)	3.5 (1.6)	3.1 (1.4)	*	*
V10Z 1-322D	Compression	15.4 (7)	—	—	—	—	—	—	—	11.8 (5.4)
	Shear	9.9 (4.5)	—	8.2 (3.7)	6.7 (3)	5.6 (2.5)	4.7 (2.1)	4.1 (2.1)	*	*

*At these forcing frequencies, lesser loads will yield less than 81% isolation.

APPLICATIONS

- COMPRESSORS
- PUMPS
- BLOWERS
- TRANSFORMERS
- LIGHTWEIGHT MACHINES
- OFFICE EQUIPMENT
- MEASURING INSTRUMENTS
- SCALES

- Acoustical floating floar
- Acoustical floating ceiling
- Acoustical floaing wall

-Metal Stud 10cm

AL ZAHABIA
WALLS & CEILINGS
PROFESSIONALS

Component of frame system (ST)

Description & Usage	Item	Dim			Thickness	Length	Req. Per Sq Meter	
		A	B	C			Centers 40 CM	Centers 60 CM
Galvanized C shaped Metal Section used with U Track to provide Vertical framework for Partitions	ST 50	48	34/40	6	0.5 -1.2 mm	3000	1.8	2.40
	ST 70	68	34/40	6	0.5 -1.2 mm	3000	1.8	2.40
	ST 90	88	34/40	6	0.5 -1.2 mm	3000	1.8	2.40
	ST 100	98	34/40	6	0.5 -1.2 mm	3000	1.8	2.40
	ST 120	118	34/40	6	0.5 -1.2 mm	3000	1.8	2.40
	ST 150	145	34/40	6	0.5 -1.2 mm	3000	1.8	2.40

All profiles are fabricated from hot dipped Galvanized Steel Sheet comply with ASTM A653 and ASTM C754
Other Sizes and Length can be Produce upon Request

Component of frame system (TK)

Description & Usage	Item	Dim		Thickness	Length	Req. Per Sq Meter
		A	B			
Hot dipped Galvanized U shaped metal section used to receive ST studs to provide framework for wall linings and partitions	TK 50	50	20/35	0.5 -1.2 mm	3000	0.8
	TK 70	70	20/35	0.5 -1.2 mm	3000	0.8
	TK 90	90	20/35	0.5 -1.2 mm	3000	0.8
	TK 100	100	20/35	0.5 -1.2 mm	3000	0.8
	ST 120	120	20/35	0.5 -1.2 mm	3000	0.8
	ST 150	150	20/35	0.5 -1.2 mm	3000	0.8

All profiles are fabricated from hot dipped Galvanized Steel Sheet comply with ASTM A653 and ASTM C754
Other Sizes and Length can be Produce upon Request

CODE	SIZE	Thickness	Length
FB1	70	0.5 -0.8 mm	3000

Flat Bracing strip for hanging on partition fabricated from hot dipped galvanized steel comply with ASTM A653

ETMS ACOUSTICAL CONSULTANT

-layer Gypsum board

KNAUF

Knauf Regular Gypsum Board

Knauf Regular Gypsum Board

Product Description

Knauf Regular Gypsum Boards are gypsum wallboards which are essential for standard lightweight drywall constructions.

Specification

- Material: Gypsum
- Product Dimensions:
- Width: 1200 mm
- Length: 2400 or 3000 mm*
- Thickness: 6.5 mm / 9.5 mm / 12.5 mm / 15 mm
- Product Weights: (12.5mm): approx. 7.5 kg/m² (15mm): approx. 11.5 kg/m²
- Edge Detail: Taper Edge (TE)
- Appearance: Ivory / Grey Paper Liner

Product Features

- Lightweight constructions.
- Easy, fast and dry application.
- Good sound insulation performance.
- A material that breathes and balances room climate and humidity levels.
- Environmental friendly.
- Limitless design options.

Application

Knauf Regular Gypsum Boards are the essential for standard lightweight drywall construction and are used as the cladding component for:

- Drywall partitions using metal frames.
- Suspended ceilings using metal frames Furring and wall linings.
- Prefabricated building units.
- Drylining blockwork/concrete walls using dot and dab of a gypsum-based bonding compound.

-Enosh wall Panel 1.2m x 0.6 m

Enosh Wall Panels

are your answer to your acoustical and aesthetic needs with their strong around absorbing performance, durability and eye-pleasing appearance. These panels are available in a wide variety of sizes, shapes and colors. They allow you to create an effective sound control treatment that is distinctly designed for your environment.

FEATURES:

- Class 1 Fire Rated.
- NCR Rating .85 - 1.15.
- Custom Sizing up to 1200mm' × 600mm' .
- 36Kg - 40Kg per cubic meter density.
- Various mounting system.
- Option for beveled, mitered or radius edges.

PANEL COMPONENT :

-Acoustic textile.
-Rock wool 5 cm .
-Engineering wood frame 5 CM.
-KLC Film.

APPLICATION:

- Houses of Worship.
- Tele conferencing & Video conferencing.
- Classrooms.
- Broadcast & Recording studios.
- Home theaters.
- Multi-Purpose rooms.

SOUND ABSORPTION DATA (NCR VALUES)

OCTAVE BAND FREQUENCIES (Hz)							
product	**125**	**250**	**500**	**1000**	**2000**	**4000**	**NRC**
1" thick	**.14**	**.27**	**.80**	**1.11**	**1.14**	**1.14**	**.85**
2" thick	**.22**	**.81**	**1.24**	**1.30**	**1.21**	**1.16**	**1.15**